PREFACE 3

1. INTRODUCTION 4

1.1 The Origin and Development of Small Arms 4
1.2 Basic principles and classification of Small Arms 6
1.3 The Origin and Development of guns 11
1.4 Basic Principles and Classification of Heavy Guns 14
1.5 General Problems of Weapon Development 17

2. GUN BARRELS IN GENERAL 22

2.1 Regions and Types of the Barrel 22
2.2 Firing Phenomena Affecting Gun Barrels 26
2.3 Recoil Forces 31
2.4 Vibration 33
2.5 Droop and Bend of Gun Barrels 36
2.6 Heating 38
2.7 Wear and Erosion 51

3. DESIGN OF BARRELS 54

3.1 Chamber Requirements, Groove Profile and Rifling 54
3.2 Monoblock Gun Barrel Design 65
3.3 Autofrettage of Barrels 73
3.4 Shoulder Fired AT Weapons 78
3.5 Jacketed Artillery Barrels 80
3.6 Loose Liner Artillery Tube 82
3.7 Barrel Devices 83

4. OPERATIONAL ANALYSES OF WEAPON MECHANISMS 88

4.1 Operational Cycle 88
4.2 Analyses of Functional Mechanisms 91
4.3 Forces and Impulse Diagram 99
4.3 Impact of Weapon Mechanism Components 102

5. BREECH CLOSURES 110

5.1 Fixation of the Barrel in Weapon Casing 110
5.2 Strength – strain Analysis of the Barrel Closure 114
5.3 Sealing of Breechblocks in Weapon Closure 117

6. DESIGN OF BREECH ASSEMBLIES 121

6.1 Unlocked Breeches 121
6.2 Locked Breeches 125
6.3 Accelerators of Breeches 152
6.4 Rebound Hindrances of Breeches 159

7. CASE EXTRACTORS AND EJECTORS 163

7.1 Extraction Force 163
7.2 Design of Case Extractors and Ejectors 165
7.3 Stress Analysis in Ejector Mechanisms 170

8. FIRING, TRIGGER AND SAFETY MECHANISMS 174

8.1 Striking, Igniting and Trigger Mechanisms at Small Arms 174
8.2 Striking, Igniting and Trigger Mechanisms at Guns 178
8.3 Safety Mechanisms 181

REFERENCES 186